(a) $1$; $(\alpha_0\beta_0)$; $(\alpha_1\beta_1)$; $(\alpha_0\beta_0)(\alpha_1\beta_1)$,

(b) $1$; $(\alpha_0\beta_0)(\alpha_1\beta_1)$; $(\alpha_0\alpha_1\beta_0\beta_1)$; $(\alpha_1\alpha_0\beta_1\beta_0)$,

(c) $1$; $(\alpha_0\beta_0)(\alpha_1\beta_1)$; $(\alpha_0\alpha_1)(\beta_0\beta_1)$; $(\alpha_0\beta_1)(\alpha_1\beta_0)$.

The group must be transitive since the equation is irreducible. Hence we may exclude (a).

It cannot be (b) since (b) is the regular cyclic group, and the equation, if this were its group, would be Abelian.

We compute $(\alpha_0-\beta_0)(\alpha_1-\beta_1)$ which belongs to the group (c):

$$\alpha_0\beta_0+\alpha_1\beta_1+\alpha_0\beta_1+\alpha_1\beta_0+\alpha_0\alpha_1=b.$$

$\therefore \alpha_0\beta_1+\alpha_1\beta_0+\alpha_0\alpha_1+\beta_0\beta_1=b-2.$

Factoring this, $(\alpha_0+\beta_0)(\beta_1+\beta_1)=b-2$. Squaring, and remembering that $\alpha_0\beta_0=\alpha_1\beta_1=1$,

$$(\alpha_0-\beta_0)^2(\alpha_1-\beta_1)^2=[(\alpha_0+\beta_0)^2-4][(\alpha_1+\beta_1)^2-4].$$

$\therefore (\alpha_0-\beta_0)(\alpha_1-\beta_1)=2\sqrt{[(1+\frac{1}{2}b)^2-a^2]}$, and as the irrationality of the radical is one of the conditions for irreducibility this group cannot be the group of the equation. The group of the equation is therefore $G_8$.

## PROBLEMS FOR SOLUTION.

### ALGEBRA.

**208. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College Defiance, O.**

Solve $x^4+y^4=14x^2y^2$; $x+y=m$.

**209. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.**

Prove that $(a^4+b^4+c^4+d^4)>4abcd$.

**210. Proposed by W. J. GREENSTREET, A. M., Editor of The Mathematical Gazette, Stroud, England.**

The sum of five quantities and the sum of their cubes are both zero. Show that the sum of their fifth powers is a factor of the sum of any odd powers of the quantities.

### GEOMETRY.

**236. Proposed by J. R. HITT.**

If two sides of a triangle pass through a fixed point, the third side touches a fixed circle.

237. Proposed by S. A. COREY, Hiteman, Iowa.

Let $AB$, $BC$, $CD$, $DE$, $EA$ be the sides of a pentagon, plain or gauche. Double the length of $CB$ and $DE$ by extending from $B$ and $E$ to $G$ and $H$, respectively. Draw $B'D$ parallel to and of the same currency as $BC$. Connect $G$ and $H$. Then prove that $2(AB^2+BC^2+CD^2+DE^2+EA^2)=3CD^2+4(DE.BC.\cos EDB+EA.AB.\cos EAB)+GH^2$.

238. Proposed by O. W. ANTHONY, Head of the Mathematical Department, DeWitt Clinton High School, New York.

Construct a trapezoid having given the sum of the parallel sides, the sum of the diagonals, and the angle formed by the diagonals.

## CALCULUS.

183. Proposed by W. J. GREENSTREET, A. M., Stroud, England.

Evaluate $\int_0^\infty \frac{\sin 2nx dx}{(a^2+x^2)\sin x}$.

184. Proposed by W. J. GREENSTREET, A. M., Stroud, England.

If $u=f(x, y)$; $\xi=e^x y$; $y\eta=e^x$; show that

$$\frac{d^2u}{dx^2}-y^2\frac{d^2u}{dy^2}-y\frac{du}{dy}=4\xi\eta\frac{d^2u}{d\xi.d\eta}.$$

## MECHANICS.

121. Proposed by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

Prove that the electrical capacity of an oblate ellipsoid of revolution is $\sqrt{(a^2-b^2)}/\cos^{-1}(b/a)$, where $a$ and $b$ are the equatorial and polar semi-diameters.

## AVERAGE AND PROBABILITY.

156. Proposed by J. E. SANDERS, Hackney, Ohio.

Find the average area of a triangle, the sum of whose sides is constant and equal to $2a$.

## DIOPHANTINE ANALYSIS.

122. Proposed by L. E. DICKSON, Ph. D., The University of Chicago.

If $p$ is a prime $(p^4-1(p^2-1)$ has no factor of the form $1+p^3x$, $x>0$, if $p>2$; $(p^6-1)(p^4-1)(p^2-1)$ has no factor of the form $1+p^5x$, $x>0$.